

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Pyrgulopsis morrisoni*

COMMON NAME: Page springsnail

LEAD REGION: Region 2

INFORMATION CURRENT AS OF: October, 2005

STATUS/ACTION:

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: April 11, 2002

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date:

☐ Did the petition requesting a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements; emergency listings; and essential litigation-related administrative and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the 12 months, see the discussion of "Progress on Revising the Lists" in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): 1989

☐ Candidate removal: Former LP: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or

continuance of candidate status.

___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Snails, Hydrobiidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Arizona

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Yavapai County, Arizona

LAND OWNERSHIP: Bubbling Springs, Bass/Bass House Springs, and Page/Cave Springs are located on property owned by the Arizona Game and Fish Commission and managed by the Arizona Game and Fish Department (AGFD). Shea Springs is located on property owned by the Phelps Dodge Corporation. Lolomai Springs is located on property owned by the Lolomai Springs Resort. Fry Springs and Turtle Springs are located on private property.

LEAD REGION CONTACT: Susan Jacobsen, 505-248-6641

LEAD FIELD OFFICE CONTACT Mike Martinez, Arizona Ecological Services Field Office, Phoenix, 602-242-0210 ext. 224

BIOLOGICAL INFORMATION: The Page springsnail (*Pyrgulopsis morrisoni*) was described by Taylor (1987). Most freshwater gastropods are herbivorous or detritivores that consume algae, bacteria, and decaying organic material, or that passively ingest small invertebrates while feeding. Respiration in hydrobiid snails is strictly aquatic via an internal gill with some oxygen absorption through the mantle (soft body). Hydrobiid snails are sexually dimorphic, and females are characteristically larger and live longer than males. Most prosobranch snails (snails that have gills and an operculum) are annual species that reproduce several times during the breeding period (spring-fall) with varying degrees of replacement of generations. While longevity is variable, most prosobranch snails live 9 to 15 months (Taylor, 1987; Pennak, 1989; Brown, 1991).

Page springsnail habitats are isolated, mid-elevation (~1070 meters (3,510 feet)), permanently saturated, spring-fed aquatic climax communities commonly described as ciénegas. These habitats are characterized by firm substrates, as well as aquatic macrophytes and Rhizoclonium algal mats, and are surrounded by wetland and riparian vegetation.

The species is a local endemic and all extant populations are known to exist only within a

complex of springs located within an approximately 1.5 kilometer (.93 miles) area adjacent to Oak Creek around the community of Page Springs, Yavapai County (T16N, R4E). The distribution of the Page springsnail is the Upper Verde River drainage of Arizona, with the type locality found in Page springs. The Oak Creek springs complex includes Fry Springs, Lolomai Springs, Bubbling Springs, Turtle Springs, Bass House Springs, Page/Cave Springs, and several unnamed springs. Historically, at least one population was found in Shea Springs adjacent to Tavaschi Marsh and Peck's Lake east of Clarkdale, Yavapai County (T16N, R3E). That population is believed to be extirpated. Preliminary population and density estimates have been compiled during two separate survey seasons during the summers of 2001 and 2002 (see Monitoring section below for additional information).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The destruction, modification, and curtailment of habitat and range has had the greatest influence on the decline of the species. Many of the springs where the Page springsnail occurs have been subjected to some level of modification to meet domestic, agricultural, ranching, fish hatchery, and recreational needs.

Impoundments and outflow restrictions have inundated Fry Springs, Lolomai Springs, Bubbling Springs, Turtle Springs, and Shea Springs. Bass House Springs has been modified by a cinderblock enclosure. Portions of Page Springs have been converted to an underground water collection. Lolomai Springs, Bubbling Springs, Turtle Springs, and Bass House Springs are subjected to physical and mechanical removal of aquatic macrophytes and algae.

Impoundments have significantly affected water velocity over springheads. For instance, in Bubbling Springs low water velocity promotes the accumulation of fine sediments such as sand and silt in areas that may otherwise be dominated by gravel and pebble. It has been shown that substrate particle size is an important factor determining occurrence and density of springsnails. Springsnails occur more often and in greater numbers in gravel and pebble substrates, while occurring less often and in fewer numbers in sand and silt substrates (Martinez and Thome, In press). Although Bubbling Springs is believed to harbor the largest concentration of springsnails, it is unknown how restoration to a natural free-flowing condition would affect that population.

Modifications to Bass House Spring (i.e., replacement of the wooden shed with a roofed chain-link fence enclosure, April 2001) were intended to preserve the springhead and secure habitat for reintroducing Page springsnails (AGFD, 2003). It is unclear what effect this modification had on Page springsnail at this particular site. In 2001-02, springsnails were found residing in Bass House Spring's outflow and in a nearby drainage, but not within the springhead (Sorensen *et al.*, 2002).

Most of the outflow from Cave (Page) Springs has been diverted into an underground water collection gallery for fish hatchery operations. However, each of these springs still retain limited surface flow and habitat for Page springsnail. Monitoring surveys in 2001 and 2002 detected springsnails at Cave (Page) Springs.

Although not an imminent threat to the Page springsnail, ground water withdrawal is a concern and has been implicated in the decline of other freshwater mollusks, including other springsnails. Current ground water pumping in the Verde Valley is minimal, probably less than 20,000 acre-feet per year (McGavock, 1996). Recent studies indicate that the groundwater system of the Verde Valley, particularly the Verde Formation and underlying Supai Formation, has not yet been affected by development (Koniowski and Leake, 1997) and base flow in the Verde River has remained virtually unchanged since 1915 north of Clarkdale (Owen-Joyce and Bell, 1983). However, because municipal and industrial reliance on ground water is continually growing to meet the demands of an expanding human population in the Verde Valley, future water levels and stream base flows will eventually be affected and continued data collection and groundwater monitoring is needed to detect and evaluate those effects (Owen-Joyce and Bell, 1983; McGavock, 1996; Koniowski and Leake, 1997). If pumping of the aquifer were to substantially alter water flow towards the Oak Creek springs complex, much of the habitat currently occupied by the Page springsnail could be adversely affected or eliminated.

B. Overutilization for commercial, recreational, scientific, or educational purposes. The Page springsnail has been subjected to a limited number of scientific studies aimed at determining taxonomy, distribution, and habitat correlations. Between March and September 2001, FWS personnel conducted, in coordination with AGFD, a habitat study for Page springsnail within the Oak Creek springs complex. Over the course of this study, 2146 live springsnails were collected. Preliminary analysis suggests that sampling-without-replacement may contribute to an immediate seasonal decline in abundance (unpublished data). AGFD monitoring surveys for the summer and autumn of 2001 observed snail densities of 50-100 snails/m². One year later, the springsnail densities for these sites were approximately 10 times as high as those in 2001. AGFD believes collection of specimens had only a temporary impact, and that the Page springsnail is resilient to disturbance and reductions in abundance (Sorensen *et al.*, 2002). However, interagency monitoring no longer entails the removal of snails. The Page springsnail is not utilized for commercial or recreational purposes.

C. Disease or predation. Many predators occur within ciénegas, including fish, waterfowl, and other invertebrates. Remnants of Page springsnail shells have been found in stomach analysis of mosquitofish, *Gambusia affinis*, from the Oak Creek springs complex. An extensive assemblage of predatory fish species has access to Shea Springs from Tavaszi Marsh and Peck's Lake. Ducks and other migratory waterfowl are known to utilize Lolomai Springs pond and Tavaszi Marsh. No information is available on Page springsnail diseases.

D. The inadequacy of existing regulatory mechanisms. Arizona Game and Fish Department management plans for the Bubbling Ponds and Page Springs fish hatcheries include provisions to protect endemic invertebrates and provide habitat for the Page springsnail. The Environmental Assessment for the Page Springs Hatchery Renovation included commitments to replace lost habitat and to monitor remaining populations.

Seasonal monitoring surveys within the Oak Creek springs complex were started in March 2001 by FWS and AGFD. This monitoring protocol was revised in April 2002, and AGFD has 3 staff biologists working on Page springsnail conservation and monitoring. Initial funding for AGFD

to manage this mollusk was provided from a Section 6 grant, Arizona Heritage Funds, and Nongame Wildlife Checkoff Donations. Recently, AGFD has secured a State Wildlife Grant for the conservation and management of mollusks of greatest conservation need in Arizona—which will include the Page springsnail.

E. Other natural or manmade factors affecting its continued existence. Other factors that have contributed to the decline of Page springsnail populations include the use of toxic substances, water quality degradation, and introduction of nonnative organisms.

Various chemicals known to be lethal to gastropods, including chlorine and rotenone, have been used to eliminate unwanted fish and reduce the spread of fish diseases and parasites at Bubbling Ponds. Other herbicides have been used at Lolomai Springs to control aquatic vegetation. Fish collected from Peck’s Lake have exhibited elevated levels of mercury.

Nonnative mollusks, such as *Corbicula* spp. and other snails, are also found within the Oak Creek springs complex and may act as competitors. Lastly, endemic species whose populations exhibit a high degree of geographic isolation are extremely susceptible to catastrophic events and stochastic extinction.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED: The FWS has developed a draft conservation assessment and strategy for the Page springsnail. The AGFD has assumed lead for the development of a candidate conservation agreement and we are currently coordinating with them and other landowners in this process.

SUMMARY OF THREATS: Many of the springs where the Page springsnail occurs have been subjected to some level of modification to meet domestic, agricultural, ranching, fish hatchery, and recreational needs. Although not an imminent threat to the Page springsnail, ground water withdrawal is a concern. Nonnative species and application of chemicals have contributed to decline of Page springsnail in the past and pose potential threats to this species in the future.

For species that are being removed from candidate status:

___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES: Continue working with AGFD and other landowners to develop and implement a conservation agreement that alleviates threats to the species and its habitat.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1

	Non-imminent	Species	2
		Subspecies/population	3
		Monotypic genus	4
		Species	5*
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Most of the springs in which the species is found have been modified or subjected to some form of adverse management action. Habitats continue to be maintained in their modified form and management actions that could result in the take of snails are likely to continue.

Imminence: Based on recent survey data it appears that the Page springsnail is abundant within its habitats and is more widely distributed than previously known. In addition, the threat of ground water withdrawal is not considered imminent because recent studies indicate that the groundwater system of the Verde Valley has not yet been affected by development and base flow in the Verde River Valley has remained virtually unchanged since 1915. In addition, interagency monitoring no longer entails the removal of snails, which appears to have had a temporary impact to population numbers. We believe that the immediacy of the threats facing the Page springsnail status are best characterized as non-imminent.

 X Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes.

Is Emergency Listing Warranted? No. We are working with AGFD to conserve the Page springsnail and its habitat.

DESCRIPTION OF MONITORING: Initial calculations during May, 2001, for Cave Spring showed a total population size = 6242 springsnails, SE = 1603, within a habitat area of 2.1 m², and a density = 3038 springsnails, SE = 780, (unpublished data). Calculations were based on the methodology described by Seber (1982) and Cochran (1977). Preliminary estimates of springsnail density in 2001-2002 suggest that springsnails may exhibit seasonal differences in abundance. Preliminary estimates of springsnail density at springs on the Page Springs Fish Hatchery (samples pooled from 5 springs) were: approximately 50-100 snails/m² in Autumn and Winter of 2001-02; over 500 snails/m² in Spring 2002; and approximately 350-1200 snails/m² in Summer 2002 (Sorensen et al. 2002). Total population estimates for these sites are difficult to access due to seasonal variation in area and use of wet habitat. Preliminary estimates of springsnail density at Bubbling Springs (samples pooled from suitable habitat only) were: approximately 100-650 snails/m² in autumn and winter of 2001-02; and nearly 8000 snails/m² in

spring 2002 (Sorensen et al 2002). Sorensen et al. (2002) estimated that in November 2001, suitable habitat at Bubbling Springs (estimated at 340 m² or about 25% of the total surface area of the pond) had an average density of 119 snails/m²—or total population of over 40,900 springsnails). Suitable springsnail habitat at Bubbling Springs appears to be concentrated around numerous springvents in the northwestern quarter of the pond and along the western shore out to approximately 1/3 to the middle of the pond. The eastern 2/3 of this site, including the eastern shoreline, and the springvents themselves appear unsuitable habitat and typically absent of springsnails. During recent survey efforts, the Page springsnail was found in two new unnamed springs in the area of Page springs, and was also found to be more widely distributed in known springs, particularly in the area of Bubbling Springs.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Arizona

Indicate which State(s) did not provide any information or comments: NA

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Rich McDonald 11/17/2005
Acting Regional Director, Fish and Wildlife Service Date



Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005
Conducted by: Mike Martinez